

# COPY

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
21 August 2003 (21.08.2003)

PCT

(10) International Publication Number  
**WO 03/069383 A3**

(51) International Patent Classification<sup>7</sup>: G02B 6/293, 6/28

CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.

(21) International Application Number: PCT/GB03/00605

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(22) International Filing Date: 11 February 2003 (11.02.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
10/073,101 12 February 2002 (12.02.2002) US

(71) Applicant: BOOKHAM TECHNOLOGY PLC  
[GB/GB]; 90 Milton Park, Abingdon, Oxon OX14 4RY (GB).

(72) Inventors: BETTY, Ian; 73 Robinson Avenue, Ottawa, Ontario K1N 8N8 (CA). POIRIER, Maxime; 4-156 boulevard du Plateau, Hull, Quebec J9A 3G2 (CA).

(74) Agents: CLAYTON-HATHWAY, Anthony, Nicholas et al.; Fry Heath & Spence LLP, The Gables, Massetts Road, Horley, Surrey RH6 7DQ (GB).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,

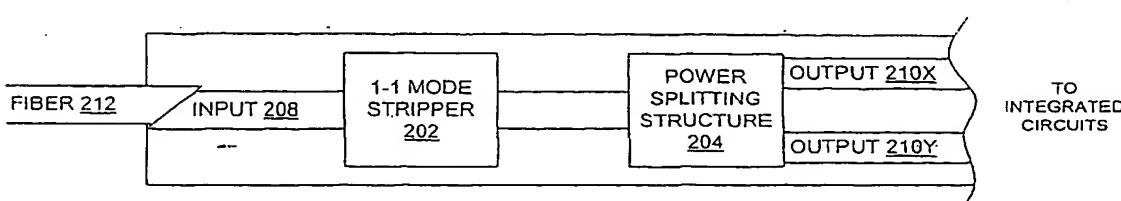
**Published:**

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:  
6 November 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: WAVEGUIDE MODE FILTER FOR INTEGRATED OPTICAL COMPONENTS



WO 03/069383 A3

(57) Abstract: Through the introduction of an imaging multimode interference device in an integrated optical circuit, such performance degradations as lateral waveguide field oscillations and backreflections may be suppressed. The suppression of lateral waveguide field oscillations (that may occur due to misaligned optical coupling), in particular, can significantly reduce variations in the power splitting ratio of an optical power splitting structure, such as those employed by a Mach-Zehnder modulator.

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 03/00605

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 G02B6/293 G02B6/28

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|----------|---|-----------------------|
| X        | LEUTHOLD J ET AL: "SPATIAL MODE FILTERS REALIZED WITH MULTIMODE INTERFERENCE COUPLERS"<br>OPTICS LETTERS, OPTICAL SOCIETY OF AMERICA, WASHINGTON, US,<br>vol. 21, no. 11, 1 June 1996 (1996-06-01),<br>pages 836-838, XP000594898<br>ISSN: 0146-9592<br>the whole document<br>--- | 1-4,9,<br>13,14       |
| X        | EP 0 881 512 A (LUCENT TECHNOLOGIES INC)<br>2 December 1998 (1998-12-02)<br>abstract; figure 2<br>---   | 1,3,9<br>-/-          |

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

## • Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

4 July 2003

Date of mailing of the international search report

25.09.03

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl  
Fax: (+31-70) 340-3016

Authorized officer

Jakober, F

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 03/00605

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|----------|---|-----------------------|
| A        | JENKINS R M ET AL: "A NOVEL WAVEGUIDE<br>MACH-ZEHNDER INTERFEROMETER BASED ON<br>MULTIMODE INTERFERENCE PHENOMENA"<br>OPTICS COMMUNICATIONS, NORTH-HOLLAND<br>PUBLISHING CO. AMSTERDAM, NL,<br>vol. 110, no. 3/4,<br>15 August 1994 (1994-08-15), pages<br>410-424, XP000454981<br>ISSN: 0030-4018<br>the whole document<br>----- | 1-4,9,<br>13,14       |

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB 03/00605

### Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-4, 9, 13, 14

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-4,9,13,14

Integrated optical circuit comprising a MMI device coupled to an optical power splitter

2. Claims: 5-8

A method for monitoring error signal from a dump port of a MMI device

3. Claims: 10-12

An integrated optical circuit comprising an optical device having an angled output and a MMI device

4. Claims: 15,16

A semiconductor optical amplifier or an attenuator comprising an electrode in contact with a MMI device

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 03/00605

| Patent document cited in search report | Publication date |          | Patent family member(s) | Publication date         |
|--|------------------|----------|-------------------------|--------------------------|
| EP 0881512                             | A 02-12-1998     | US<br>EP | 5889906 A<br>0881512 A2 | 30-03-1999<br>02-12-1998 |